Devi Ahilya Vishwavidhyalaya, Indore, India Institute of Engineering & Technology						II Year B. Tech. (Mechanical Engineering) (Full Time)
Course Code & Name	**Instructions Hours per Semester and Credits**					
4RMPC4 **FLUID MECHANICS**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**		
	30	**10**	**20**	**60**	**120**	**4**

Course Learning Objectives:

The course is designed

1. To make a fundamentally strong base to design fluid systems
2. Understand the different fluid properties
3. To develop skill to analyze fluid-flow patterns
4. To become conversant with 'Fluid Dynamics, Fluid Kinematics in External and internal flows, Compressible flows.

Pre requisite(s) : Applied Mathematics I/II/III/IV, Applied Mechanics, Strength of Materials, Engineering Thermodynamics, Engineering Physics

COURSE CONTENTS

UNIT-I

Review of Fluid Mechanics: Introduction, Fluid Properties, Pressure and its measurement, Hydrostatic forces on submerged surfaces, Buoyancy and Stability. Relative Equilibrium.

Fluid Kinematics: Lagrangian and Eulerian Approaches, Fundamentals of Flow visualization, Potential flow, Stream function and Velocity Potential function, Vorticity, Rotationality and Circulation, Flow Nets, Reynold's Transport Theorem.

UNIT-II

Fluid Dynamics: Introduction, Conservation of mass, Mechanical energy and efficiency, Bernoulli's equation, Applications of Bernoulli's equation, Correction factors, Newton' Law and Conservation of momentum, Linear Momentum equation, Angular Momentum equation. Introduction to boundary layer, Laminar and Turbulent boundary layers, Boundary Layer Thickness, Reynold's, Number, Boundary Layer Separation.

UNIT-III

Flow over Bodies: Introduction, Navier-Stokes Equations, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of common geometries, Parallel Flow over Flat Plates, Flow over Cylinders and Spheres, Aerofoils, Lift, Von-Karmon Vortex Street, Kutta-Joukowski Equation.

UNIT-IV

Flow Trough Conduits: Flow through Pipes: Introduction to Laminar and Turbulent Flows, Entrance region, Fully Developed flow, Laminar Flow in pipes, Turbulent flow in pipes, Losses in Pipe flow, Hagen-Poiseuille's Equation, Darcy's Weisbach Equation, Moody's Chart, Piping Networks.

Open Channel flow: Classification, Froude' Number and Wave Speed, Specific energy, Continuity and Energy equations, Uniform flow and Gradually Varied flow.

UNIT-V

Compressible Flow: Stagnation Properties, Speed of Sound and Mach Number, One- Dimensional Isentropic Flow, Isentropic Flow Through Nozzles, Shock Waves and Expansion Waves, Rayleigh and Fanno Flows. Introduction to Computational Fluid Dynamics (CFD) System.

BOOKS RECOMMENDED:

[1] Douglas John F., *Fluid Mechanics*, Pearson Education, 2005.

[2] Centgel Y. A., *Fluid Mechanics: Fundamentals and Applications*, McGraw-Hill Co, 2003.

[3] Streeter V. L and Wylie E. B., *Fluid Mechanics*, McGraw-Hill Co, 2003.

[4] White F., *Fundamentals of Fluid Mechanics*, McGraw-Hill Co, 2003.

[5] Fox R.W., McDonald A T., Pritchard P. J., Mitchell J. W., *Fluid Mechanics,* 9ed 2015

LIST OF PRACTICAL ASSIGNMENT

1. To verify Bernoulli's Theorem.
2. Calibration of Venturimeter and Orifice-meter.
3. To find the Friction Coefficient of different pipes.
4. Determination of different coefficients of the orifice
5. Calibration of external cylindrical mouth pieces of different diameters/ Different L/D ratios
6. Calibration of internal cylindrical or Borda's mouth piece.
7. To Visualize the Forced/ Free Vortex Phenomenon.
8. To determine loss of head in the fittings at various water flow rates.
9. To Plot velocity potential and stream functions.
10. To find the metacentric height of prismatic body.

Course Outcome:

Course Out Come (CO)	After completion of the course, students will be able to:
CO1	Well established concepts of the theory of fluid mechanics.
CO2	Develop bases of analyses in fluid mechanics.
CO3	Understand the fundamental mechanics involved Navier stokes equations, bases of Drag, Lift & other flows of bodies.
CO4	Understand the fundamental mechanics involved in different fluid flow cases in applications
CO5	Develop a base for Computational Fluid Dynamics.

CO-PO-PSO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3
CO 1	3	3	3	1	2	0	0	0	0	0	2	3	2	0
CO 2	3	1	3	3	3	1	0	0	0	0	1	3	1	1
CO 3	3	1	3	3	3	1	0	0	0	0	2	3	2	0
CO 4	3	1	3	3	2	1	0	0	0	0	1	3	1	0
CO 5	3	3	1	3	2	1	0	0	0	0	1	3	2	0

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)
1→ relevant and small significance 2 → medium or moderate and 3 →strong